

multiple cameras, multiple sensing capabilities and corresponding illumination. Different embodiments would also include “tools” to undertake a variety of physical operations ~~which are linked to the abilities claimed in Grober 6,718,130 ability of Grober 10/236,847~~ which include to capture images and sound, move to different locations and initiate physical operations using equipment onboard the buoy such as. ~~Some of these operations are already claimed in Grober 10/236,847 and include~~ GPS location reference, motorized propulsion and raising and lowering anchors and ground tackle.

[0007] Stabilizing cameras and lights on buoys for security and surveillance purposes has been impractical because buoy motion prevents a stable image. With the introduction of autonomous security systems, computers are being relied upon to interpret camera and sensor imagery from video, infrared, and other sources. During surveillance if the object is moving randomly through the sensor’s field of view due to buoy motion, it will be a more difficult if not impossible task identifying the object or it’s path of motion. In addition, various types of illumination or spectrums may be required to “see” objects within the sensor’s field of view. Stabilization of the illumination source is therefore also desirable. This invention provides the ability to integrate cameras and sensor systems, with the appropriate illumination technology, stabilize both for ease of identification and tracking, and via wired or wireless remote control, exchange images and data between the buoy and a control station. The invention also provides for other species of objects, such as tools and devices which undertake a variety of physical operations to be integrated, linked or combined with cameras and sensors wherein that integration, link or combination provides capabilities otherwise difficult if not impossible to otherwise achieve from a buoy due to buoy motion.

#### SUMMARY OF THE INVENTION

[0008] In one embodiment of this invention, the stabilized buoy, whose cameras and sensors could monitor the underside of an oil terminal pier, would also incorporate heat and fire sensors.

Should a fire occur underneath the pier, the buoy, remote controlled, either by human or computer means, moves to a fire fighting position, aims a stabilized water or chemical cannon at the flames to contain or put out the fire. Without the ability to have the cameras, sensors and tools such as the fire extinguisher device stabilized and corresponding or linked to each other, both the surveillance, physical operation and the response by the tool would be severely limited if not impossible due to motion of the buoy. impossible in moving waters.

[0009] In another embodiment, the stabilized buoy is a wharf piling painter. An automated paint gun can be programmed to paint even, continuous strokes of paint. This is accomplished because the buoy's stabilization system is stabilizing the imaging sensor to clearly sense the location of the piling and the non-painted areas on the piling. The paint gun tool, which is also stabilized against the motion of the buoy, can evenly apply paint to the non painted areas. ~~because it is also stabilized against the motion of the buoy.~~ Similar results can be obtained using other type of tools such as sand blasters, paint brushes, drills, welding irons or guns, and can accomplish tasks which are, but are not limited to; painting, drilling, welding, sandblasting or shooting. These capabilities can be controlled via wired or wireless remote controlled, or hands-on operation.

[0011] (Delete Paragraph 0011)

[0015] In firefighting applications, where fire boats, probably at least 30' long with humans would be unable to approach a burning object, a low profile buoy, such as the remote controlled buoy in Grober U.S. Pat. No 6,718,130 40/236,847 can approach a fire, easily keep its circular shape cool with a shower-like stream of water, keep cameras trained on the fire, and use water cannon mounted on the stabilizer to pump water or chemical retardants into flames.

[0017] In a further embodiment, the stabilized platform can move and stabilize the payload plate 360 degrees in azimuth and in two horizontal orthogonal axis thus providing global surveillance around the buoy platform. This includes above the water using air based sensors such as cameras, and simultaneously below the water using underwater sensors such as cameras, sonar or other relevant sensors.

[0018] In another embodiment the payload platform being above the center of the pitch and roll axis, has an extension arm which projects downward ~~below the location of the pitch and roll axis~~ so as to stabilize a lower payload platform below the water surface. The result is that the invention is able to stabilize sensors and devices on the top stabilized plate as well as sensors and devices on the submerged lower stabilized plate and which could include tools, which can be extended into the water. In a surveillance mode, this would allow surveillance above the horizon with sensors, such as cameras, and surveillance below the surface with devices such as sonar. A further actuating mechanism such as a hydraulic piston located in the extension arm ~~the projects downward below the location of the pitch and roll axis,~~ can compensate for the rise and fall of the buoy platform. ~~to the extent of the piston arm extension. in the lower section.~~ This would keep a sensor, such as a sub surface sensor at a fixed level, to the extent of the piston arm extension. ~~for instance 1 foot below the surface.~~

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

### FIG 1

[0028] A floating platform 1 is made of a buoyant material or water tight enclosure that is of a size and shape capable of supporting the weight of the tool 8, camera 5, stabilizing system 2, which is shown as the device from the base plate 4, to the stabilized payload plate 3, the ground tackle system 9, propulsion system 12, and an operator if applicable in certain embodiments. The outer shell is preferably of a shock absorbing material that will preclude damage to passing vessels and the platform should the two come into physical contact. The size, shape and material of platform 1 ~~will~~ can vary depending on the weight and dimensions of the stabilization system, tools and camera or sensors which the buoy must support in various sea conditions.

[0029] Stabilizing system 2, preferably a three axis stabilized electronic waterproof unit head, such as the Perfect Horizon stabilization head (made by Motion Picture Marine in Marina del Rey Calif.) or other stabilization device, is securely mounted on top of buoy float 1. The stabilizing unit head, 2 is preferably remote controlled and/or autonomous. An example of a suitable electronic stabilization head is also disclosed and claimed in U.S. Patent; Grober U.S. Pat. No. 6,611,662, Autonomous, Self Leveling, Self Correcting Stabilizing Platform, incorporated by reference herein. Note that a two dimension stabilization system may also be used, but a three dimension stabilization system is preferred.

[0030] Tool support platform 3 provides an attachment mechanism for securing a tool 8, such as a fire nozzle, camera 5, and any other objects which need to be stabilized from the motion of the buoy. The distance of the tool above the water can be varied by adjusting components that would determine height and may include the use of a jack screw or similar extending device as an element of base plate 4.

[0033] Camera 5 is equipped with controls which can be remotely operated by commands from the remote operator. Preferably the commands in remote operating mode include a minimum of camera on/off, zoom, iris control, focus, pan and tilt. More specifically, the camera 5 and the firefighting tool 8, are controlled by wireless to an operator on the remote boat 16. Attached to camera 5 is transmitter 7 which transmits the image and camera data through camera mounted antenna 19. This is received by antenna 19 located on boat 16. The image and data are viewed by the operator 15 on monitor 18, and the operator using control panel 17, sends wireless signals back through boat antenna 19 to camera mounted antenna 19, which controls the stabilization system, the tool, and the camera system. Many

current surveillance cameras have this wireless remote control feature built in for controlling all camera functions including on/off, zoom, iris and camera pan and tilt.

Each tool or device to be remotely controlled on the buoy will have its own control mechanisms which can all feed through the antennas located on the buoy or remote location and will be obvious to those skilled in the art.

The cameras, sensors, devices and tools can also be monitored and controlled on the buoy from the remote location via wire instead of wireless. In this embodiment a wire or other link such as fiber optic cable 11, capable of transmitting signals, will connect the buoy and the remote location and will be obvious to those skilled in the art.

[0035] In one embodiment, the operator 15 is stationed at a remote location such as on a nearby boat 16. The operator views the transmitted image 18, and utilizes a control panel 17 to remotely control the stabilization system, the tool, and the camera system. In the case of a fire on a pier 14, the operator can remotely move the buoy 1 into position, clearly see the pier and fire through camera 5, and operate the fire nozzle tool 8, to suppress the fire. The fire nozzle tool 8 can shoot water which comes through inlet pipe 20, pumped by pump 20, through fire hose 24. In an alternate embodiment, tank 30 may hold a fire retardant which ejects moves under pressure or is pumped through retardant fire hose 26 to the fire nozzle tool.

## FIG. 2

[0036] Buoy platform ~~2~~ 4A has a painting tool 40, which is firmly attached to the stabilized platform 42, which may be similar to any of the stabilization head embodiments such as claimed in U.S. Patent; Grober U.S. Pat. No. 6,611,662, ~~U.S. Patent; Grober 6,611,662,~~ Autonomous, Self Leveling, Self Correcting Stabilizing Platform. The stabilizing head 42 is preferably remote controlled and/or autonomous and

provides an attachment for securing a painting tool 8, camera 5, and any other objects which need to be stabilized from the motion of the buoy. The distance of the tool above the water can be varied by adjusting components that would determine height and may include the use of a jack screw as an element of base plate 44. In this embodiment, the buoy float and painting tool are painting the side of a ship.

#### **FIG 3 AND 4**

[0036] **FIG. 3** showing a side view and **FIG. 4** showing a top view, illustrate a self-stabilized platform, such as U.S. Patent; Grober U.S. Pat. No. 6,611,662, ~~in U.S. Pat. No. 6,611,662 to Grober,~~ incorporated by reference herein. The self-stabilized platform includes a pedestal base plate 201 which is firmly secured to the buoy float 1b. A rigid post 202 is attached to the base plate 201 and supports a universal joint 203. The universal joint 203 connects the post 202 to a center or balance point of the payload platform and acts as a pivot point. Attachment points 206, 208, 210, and 212 on post 202 are sleeve bearings or other rotatable bearings. Attached to each of these sleeve bearings is a combination motor M and linear actuator 214, 216, 218, and 220. An opposing end of each of the linear actuators is attached to a sleeve bearing 222, 224, 226, and 228 which is securely attached to payload platform 334.

#### **FIGURE 5**

**END OF AMENDMENTS TO SPECIFICATION**

## SUPPORT FOR AMENDMENTS TO THE SPECIFICATION

### ABSTRACT

A stabilized buoy platform for cameras, sensors, illuminators and tools, which incorporates a buoy, a stabilizing mechanism and a stabilized payload thereon. Affixed to the stabilized payload platform are sensors and tools which include cameras and sensors systems integrated with the appropriate illumination technology, all of which are stabilized both for ease of ~~tacking~~ tracking identification and monitoring of targets. The invention also provides for other species of objects and tools, applicable in surveillance, security, protection and tasks where tools need to be stabilized to perform their intended functions. This includes tools such as a paint brush, drill, welding iron or gun, and can undertake physical operations and tasks which are, but are not limited to; painting, drilling, welding, sandblasting or shooting. These capabilities can be controlled via wired or wireless remote controlled, or hands-on operation.

**SUPPORT:** Original claim 6; “The stabilized buoy platform of Claim 1 wherein the device and/or tools are, but not limited to; a paint brush, drill, welding iron and/or gun, and can accomplish tasks which are, but are not limited to; painting, drilling, welding, sandblasting and/or shooting.” The word undertake is found in Paragraph 0006 “Different embodiments would also include “tools” to undertake a variety of physical operations ...”

[0007] Stabilizing cameras and lights on buoys for security and surveillance purposes has been impractical because buoy motion prevents a stable image. With the introduction of autonomous security systems, computers are being relied upon to interpret camera and sensor imagery from video, infrared, and other sources. During surveillance if the object is moving randomly through the sensor’s field of view due to buoy motion, it will be a more difficult if not impossible task identifying the object or it’s path of motion. In addition, various types of illumination or spectrums may be required to “see” objects within the sensor’s field of view. Stabilization of the illumination source is therefore also desirable. This invention provides the ability to integrate

cameras and sensor systems, with the appropriate illumination technology, -stabilize both for ease of identification and tracking, and via wired or wireless remote control, exchange images and data between the buoy and a control station. The invention also provides for other species of objects, such as tools and devices which undertake a variety of physical operations to be integrated, linked or combined with cameras and sensors wherein that integration, link or combination provides capabilities otherwise difficult if not impossible to otherwise achieve from a buoy due to buoy motion.

**SUPPORT:** Clarifies the scope of the invention with wording found in Paragraph 0006, and original claims 7 and 8 for wired and wireless remote control.

#### SUMMARY OF THE INVENTION

[0008] In one embodiment of this invention, the stabilized buoy, whose cameras and sensors could monitor the underside of an oil terminal pier, would also incorporate heat and fire sensors. Should a fire occur underneath the pier, the buoy, remote controlled, either by human or computer means, moves to a fire fighting position, aims a stabilized water or chemical cannon at the flames to contain or put out the fire. Without the ability to have the cameras, sensors and tools such as the fire extinguisher device stabilized and corresponding or linked to each other, ~~both the surveillance, physical operation~~ and the response by the tool would be severely limited if not impossible due to motion of the buoy. ~~impossible in moving waters.~~

**SUPPORT:** (“corresponding” is original word. Paragraph 0006 “It would be desirable to have a physical configuration of the stabilization platform that includes multiple cameras, multiple sensing capabilities and corresponding illumination. Different embodiments would also include “tools” to undertake a variety of physical operations which are linked to the ability of Grober 10/236,847 to capture images and sound, move to different locations and initiate physical operations using equipment onboard the buoy.)

[0009] In another embodiment, the stabilized buoy is a wharf piling painter. An automated paint gun can be programmed to paint even, continuous strokes of paint. This is accomplished because



the buoy's stabilization system is stabilizing the imaging sensor to clearly sense the location of the piling and the non-painted areas on the piling. The paint gun tool, which is also stabilized against the motion of the buoy, can evenly apply paint to the non painted areas. ~~because it is also stabilized against the motion of the buoy.~~ Similar results can be obtained using other type of tools such as sand blasters, paint brushes, drills, welding irons or guns, and can accomplish tasks which are, but are not limited to; painting, drilling, welding, sandblasting or shooting. These capabilities can be controlled via wired or wireless remote controlled, or hands-on operation.

**SUPPORT:** This wording for these tools is found in original Claim 6.

[0010] Stabilization methods upon the buoy platform can be varied. One such embodiment is described in Grober 6,611,662. Other methods can be used without limiting the scope of the present invention. The method of actuating the stable platform would be dependent upon the device being stabilized. A high pressure fire hose or paint sprayer gun might require linear actuators, hydraulic actuators or other high force actuators to be most effective.

[0011] Deleted.

**SUPPORT:** Not part of the elected species.

[0018] In another embodiment the payload platform being above the center of the pitch and roll axis, has an extension arm which projects downward ~~below the location of the pitch and roll axis so as to stabilize a lower payload platform~~ below the water surface. The result is that the invention is able to stabilize sensors and devices on the top stabilized plate as well as sensors and devices on the submerged lower stabilized plate and which could include tools, ~~which can be extended into the water. In a surveillance mode, this would allow surveillance above the horizon with sensors, such as cameras, and surveillance below the surface with devices such as sonar.~~ A further actuating mechanism such as a hydraulic piston located in the extension arm ~~the projects downward below the location of the pitch and roll axis,~~ can compensate for the rise and fall of the buoy platform. ~~to the extent of the piston arm extension. in the lower section.~~ This would keep a

sensor, such as a sub surface sensor at a fixed level, to the extent of the piston arm extension. ~~for instance 1 foot below the surface.~~

**SUPPORT:** Rewording for clarity.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

### **FIG 1**

**SUPPORT:** Added the word “FIG 1” for clarification.

[0030] Tool support platform **3** provides an attachment mechanism for securing a tool **8**, such as a fire nozzle, camera **5**, and any other objects which need to be stabilized from the motion of the buoy. The distance of the tool above the water can be varied by adjusting components that would determine height and may include the use of a jack screw or similar extending device as an element of base plate **4**.

**SUPPORT:** Paragraph 0018 discloses “a further actuating mechanism such as a hydraulic piston...”

[0033] Camera **5** is equipped with controls which can be remotely operated by commands from the remote operator. Preferably the commands in remote operating mode include a minimum of camera on/off, zoom, iris control, focus, pan and tilt. More specifically, the camera **5** and the firefighting tool **8**, are controlled by wireless to an operator on the remote boat **16**. Attached to camera **5** is transmitter **7** which transmits the image and camera data through camera mounted antenna **19**. This is received by antenna **19** located on boat **16**. The image and data are viewed by the operator **15** on monitor **18**, and the operator using control panel **17**, sends wireless signals back through boat antenna **19** to camera mounted antenna **19**, which controls the stabilization system, the tool, and the camera system. Many

current surveillance cameras have this wireless remote control feature built in for controlling all camera functions including on/off, zoom, iris and camera pan and tilt.

Each tool or device to be remotely controlled on the buoy will have its own control mechanisms which can all feed through the antennas located on the buoy or remote location and will be obvious to those skilled in the art.

The cameras, sensors, devices and tools can also be monitored and controlled on the buoy from the remote location via wire instead of wireless. In this embodiment a wire or other link such as fiber optic cable, capable of transmitting signals, will connect the buoy and the remote location and will be obvious to those skilled in the art.

**SUPPORT:** The examiner's comment in Claim rejection 7-9 under 35 U.S.C. 112, wherein there lacks reasonable enablement for remote controlling the device(s) or operating the devices while on the buoy, have now been addressed in the description for FIG 1.

There is also, particularly within the surveillance industry, remote control technology that is already built into cameras, sensors and pointing devices such as pan/tilt heads which are embedded components of the cameras or tools, however for clarification the inventor has provided significant detail for enablement.

**END OF SUPPORT FOR AMENDMENTS TO THE SPECIFICATION**